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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/577,168

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FR-AM 1987NP

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ARKEMA INC.

PATENT DEPARTMENT - 26TH FLOOR

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PHILADELPHIA, PA 19103-3222

EXAMINER

LAO, MARIALOUIA

ART UNIT

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1621

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/577,168	Applicant(s) FAUCONET ET AL.	
	Examiner Louisa Lao	Art Unit 1621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☒ Claim(s) 4-16 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>07/20/2006</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Specification

1. The abstract of the disclosure does not commence on a separate sheet in accordance with 37 CFR 1.52(b)(4). A new abstract of the disclosure is required and must be presented on a separate sheet, apart from any other text. Applicants' Abstract is presented in the form of a foreign equivalent patent, WO2005/054171.

Claim Objections

2. Claims 4-16 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim should refer to other claims in the alternative only--, and/or, --cannot depend from any other multiple dependent claim--. See MPEP § 608.01(n). However, to further the examination of this case, all claims have been treated on the merits. Applicants however are respectfully requested to address the rectification of this issue, while similarly ensuring that the specification is free of grammatical and typographical errors.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hirao et al. (EP1125912 *in IDS & ISR* equivalent to US6713648, US'648) in view of Dockner et al. (EP784046 *in IDS & ISR* equivalent to US5817865, US'865).

4. Applicants' claims are drawn to "a method to purify (meth)acrylic acid obtained by the catalytic or redox oxidation of a gaseous substrate constituted of propane and/or propylene and/or of acrolein during the production of acrylic acid, and of isobutane and/or isobutene and/or tert-butyl alcohol and/or of methacrolein during the production of methacrylic acid. To this end: the gaseous reaction mixture is (1) fed to the bottom of an absorption column (C1) which is supplied at the top and in counter-current by at least one heavy hydrophobic absorption solvent for obtaining, at the bottom of the column (C1), a flow (4) constituted of (meth)acrylic acid, the absorption heavy solvent(s), the heavy secondary reaction products and minor amounts of acetic acid and of water (with acrylic acid during the production of methacrylic acid), and; the flow (4) coming from column (C1) is then fed to a separation column (C2). Column (C1) is operated with a flow rate of the heavy solvent being 3 to 5.6 times that of the (meth)acrylic acid in the supply gas mixture, and a rectifying column is used as a separation column (C2) operated with a supply at the top and without reflux. "

5. US'648 teaches a "method for absorbing acrylic acid, characterized by supplying an acrylic acid-containing reaction gas component obtained by the reaction of catalytic gas phase

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oxidation to an acrylic acid absorption column and advancing a high boiling inert hydrophobic organic liquid into counter-flow contact with said reaction gas in said acrylic acid absorption column with the mass flow rate of the organic liquid fixed in the range of 0.2-4.5 times the mass flow rate of the acrylic acid in the reaction gas thereby absorbing acrylic acid in said organic liquid and obtaining an acrylic acid-containing solution and a method for purifying acrylic acid, comprising a step for *purifying the acrylic acid-containing organic liquid* obtained by the step mentioned above. By this invention, a product of acrylic acid containing a low boiling substance at a low concentration can be produced.” (see abstract). US`648 teaches the temperature of the absorption column in the range of 20-70°C (col.11:24); the use of a polymerization inhibitor (col.11:36-68 bridging to col.12-1-68); ratio of absorbent to reaction gas in the range of 0.2-4.5 (col.13:14-19); the use of a heat exchanger (col. 15:21-33); the operating pressure at the top of the absorbing column in the range of 5-30kPa (col.14:68 to col.15:1); the distillate circulated to the absorption column after the low boiling substance contained therein has been separated and removed or it may be circulated to the absorption column (col.16:63-68 to col.17:22); the re-purification of the high boiling solvent and reclaim an absorbent got use in the absorption column (col.18:2-8); exemplifies the reactants, reaction conditions in Examples 1-7, showing therein the ppm levels of the low boiling substance in the distillate.

6. Applicants' claims and US`648 differ in a) that the instant claims recite a rectification without reflux, with introduction of the products to be distilled at the top, while US`648 uses a standard distillation column with reflux, with introduction at the top, where desorption by stripping with the use of an external gas (col.17:10-18 ; b) the theoretical plates of generally 1-

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10 in the absorption column of US`648 (col. 15:32-37), compared to the instant 25-50 theoretical plates (claim 6).

7. The difference a) is not unobvious in light of the teachings of the prior art. US`865 is relied upon to teach that in the combination of an absorption column with counter-current circulation of a heavy solvent, followed by introduction at the top of a desorption column, and distillation of the bottom fraction to separate off the solvent, that no reflux is mentioned but rather in col. 7, US`865 teaches the use-re-use of the same solvent for desorption in the following:

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cooled down to the absorption temperature, the actual absorption takes place. The rest of the acrylic acid remaining in the reaction gas and also part of the low boiling cocomponents are absorbed. Then the unabsorbed, remaining reaction gas is further cooled down in order that the condensable part of the low boiling cocomponents may be separated from the gas stream shown in FIG. 1 as acid water quench. In what follows, therefore, this condensate will be referred to as acid water. The remaining gas stream, the recycle gas, can then be returned in part to the reaction steps of FIG. 1 as diluting gas.

The solvent loaded with acrylic acid and cocomponents is withdrawn from the base of column K10 and fed to the desorption column K20. There the loaded solvent is stripped by a part of the recycle gas taken from the oxidation stages of the largest part of the low boilers. Since major quantities of acrylic acid are stripped off as well, this stream is recirculated, for example back into the direct condenser K9.

To enhance the desorption performance of column K20, the low boilers present in the stripping gas are removed before introduction into column K20. Technically this is advantageously done by cleaning up the stripping gas in a countercurrent wash column K19 using recovered solvent from the below-described column K30.

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In the next process step a solvent stream loaded with acrylic acid and virtually free of low boilers is withdrawn 25 from the base of the desorption column K20 and fed into the distillation column K30, which is preferably a sieve plate column. The high boiling solvent and the medium boiling cocomponents, for example maleic anhydride, condense into the base of column K30. Since the acrylic acid withdrawn at 30 the top of column K30 still comprises significant amounts of low boiling cocomponents, this low boiler content is advantageously reduced by further lengthening the rectifying section of column K30 and withdrawing the acrylic acid from the column as a sidestream. This acrylic acid is known 35 as crude acrylic acid.

The light-rich stream withdrawn at the top of distillation column K30 still contains acrylic acid and is therefore advantageously recycled back into the absorption column K10. 40

The solvent withdrawn from the base of distillation column K30, which is free of low boilers and almost free of acrylic acid, is mostly fed into the countercurrent wash column K19 in order, as mentioned above, that the low boilers may be washed out of the stripping gas stream which 45 leads into desorption column K20. The almost acrylic-acid-free solvent is then fed to absorption column K10. A small bleed stream of the almost acrylic-acid-free solvent from the base of distillation column K30 is used for subjecting the acid water, which still contains acrylic acid in solution, to an 50 extractive treatment. In this acid water extraction, part of the acrylic acid is recovered from the acid water and, in the other direction, the acid water extracts all polar components from the solvent bleed stream. The resulting acid water can be prevaporized and then incinerated. 55

The crude acrylic acid obtained from the sidestream of

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where the AA purity with further processing (Example 1-2) is 99.95%.

One of ordinary skill in the art would find it obvious to use art-known techniques and would so be motivated in order to gain the benefit of using steps that have been proven efficacious in his field and reach a reasonable expectation of purifying (meth)acrylic acid.

8. As to the difference (b) of theoretical plates. One of ordinary skill in the art would find it obvious to infer that the number of theoretical plates can affect the efficiency of his intended separation, as known from the principles of separation in his field. The artisan would so be motivated to adjust his parameters to gain an optimum separation of his by-products from his target compound and reach a reasonable expectation of purifying (meth)acrylic acid by optimizing his reaction parameters.

Claims Status

9. Claims 1-16 are pending in this application, where claim 1 is an independent claim. No claims are allowed.

Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Louisa Lao whose telephone number is (571)272-9930. The examiner can normally be reached from 8:00am to 8:00pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel Sullivan can be reached on 571-272-0779. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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